

# **MERRIAM MOUNTAINS SPECIFIC PLAN**



## **APPENDIX Y**

### **GREENHOUSE GAS INVENTORY**

GPA 04-06; SP 04-006; R04-013; VTM5381; S04-035, S04-036, S04-037,  
S04-038; Log No. 04-08-028; SCH No. 2004091166

*for the*

### **DRAFT ENVIRONMENTAL IMPACT REPORT**

**August 2007**

**MERRIAM MOUNTAINS SPECIFIC PLAN**

**GREENHOUSE GAS INVENTORY**

**May 2007**

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## GREENHOUSE GAS INVENTORY: SUMMARY OF FINDINGS

A greenhouse gas inventory was conducted to estimate emissions for full build out of the Merriam Mountains Specific Plan (MMSP) in 2020. Greenhouse gas emissions reported in Table 1 are those within the direct operational control of the project developer. They include greenhouse gas emissions associated with buildings (natural gas, purchased electricity) and landscaping (energy embodied in potable water). The inventory was based on the World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD) Greenhouse Gas Protocol (version 2).

**Table 1.** Summary of greenhouse gas emissions associated with the MMSP at build-out. The inventory assumed full implementation of the California Renewal Portfolio Standard (RPS) (33% renewable electric power by 2020). This is a baseline estimate assuming Title 24-compliant buildings and mandated improvements in the state-wide electricity supply (e.g., implementation of an expanded Renewable Portfolio Standard).

WRI/WBSD category	Emissions source	GHG emissions (Metric T CO <sub>2</sub> e/year)
Scope 1	Direct combustion	9,580
Scope 2	Purchased electricity	21,497
Scope 3	Embodied energy in water	1,179
<b>Total</b>		<b>32,257</b>

### *Definitions:*

Scope 1: Direct emissions (e.g., on-site combustion of natural gas)

Scope 2: Purchased electricity

Scope 3: Other indirect emissions

Greenhouse gas emissions were also estimated for transportation. They are presented separately since they are indirect (Scope 3) emissions under the WRI/WCSD protocol and primarily outside the direct, operational control of the project team.

**Table 2.** Summary of transportation-related greenhouse gas emissions associated with the MMSP at build-out. This estimate assumes full implementation of the Low-Carbon Fuel Standard (California Executive Order S-01-07) and a 1.6% per year increase in per capita vehicle miles traveled through 2020 (Schafer 2004).

WRI/WBSD category	Emissions source	GHG emissions (Metric T CO <sub>2</sub> e/year)
Scope 3	Transportation (gasoline)	33,269

The baseline (*a.k.a.*, base year) for this inventory is 2007 for which we assume that the project area has no significant emissions associated with implementation of the MMSP or NNP-Stonegate Merriam LLC's activities (see technical comment below regarding potential changes in on-site carbon storage).

## GREENHOUSE GAS INVENTORY: DETAILS ON CALCULATION

Greenhouse gas emissions were estimated separately for three categories of emissions: (1) commercial development, (2) residential development, (3) water consumption, and (4) transportation.

### *Commercial emissions*

The MMSP proposes 110,000 square feet of commercial space. Baseline greenhouse emissions associated these buildings were estimated based on the average electricity consumption for commercial buildings in the Cal-Arch database (a publicly available product from Lawrence Berkeley National Laboratory based on California's End Use Survey). Annual electrical usage was multiplied by the estimated 2020 grid carbon coefficient for electricity purchased from San Diego Gas and Electric to estimate metric tons of CO<sub>2</sub> (equivalent) per year.

### *Residential emissions*

The MMSP proposes 2,700 residential dwelling units. Emissions estimates were developed for three classes of residential units, including: multi-family, single-family attached, and single-family detached. Specifications for each type were based on preliminary design prototypes, including information describing average size (square feet) and the number of bedrooms per dwelling unit (CEC 2003). These specifications were used to apply observed energy use statistics for Title 24-compliant residential buildings from the California Energy Commission to estimate annual electricity and natural gas usage for each dwelling unit.

Residences were assumed to use purchased electricity for cooling, appliances, and plug-loads and natural gas for cooking and water heating. Baseline energy use was calculated as a function of kWh per square foot based on average performance for Southern California residences compliant with Title 24 (2005) standards. Each home was assumed to have one standard refrigerator. Energy use for clothes washing, dishwashers, and plug loads was based on observed performance data and estimated as a function of the number of bedrooms (CEC 2003). Household electrical use was multiplied by greenhouse emissions coefficients for the San Diego Gas & Electric Company grid (US EPA Power Profiler and eGRID database) assuming a 14% reduction in GHG intensity associated with implementation of the state-mandated renewable portfolio standard by 2020.

Natural gas use was estimated based on average gas consumption per square foot observed for Title 24-compliant Southern California homes. Natural gas consumption was multiplied by the US Department of Energy emissions coefficients for CO<sub>2</sub> per therm.

CO<sub>2</sub> for household electricity and natural gas use were combined from all dwelling units and converted to metric tons for reporting (Table 1).

### *Water*

Water use and energy use are often closely linked. The provision of potable water to commercial users and residents consumes large amounts of energy associated with five stages: source and conveyance, treatment, distribution, end use, and wastewater treatment. This inventory estimated that delivered water for the MMSP will have an embodied energy of 2,779 kWh/acre foot or 0.0085 kWh/gallon (Torcellini et al. 2003). Water demand estimates were based on the Master Plan of Water for Merriam Mountains (Dexter Wilson and Associates). Greenhouse gas emissions were calculated based on an average consumption of 1.32 million gallons per day. The embodied energy demand associated with this water use was converted to GHG emissions with the same electrical grid coefficients as the other purchased electricity.

### *Transportation*

Mobile source GHG emissions were estimated for the community's residential population. Mobile source emissions for this GHG inventory were estimated based on the MMSP Traffic Impact Analysis (Prasad 2006). The study estimated future average daily trip (ADT) generation per neighborhood within the community. Information from the U.S. Census Bureau was used to estimate average trip length for Southern California residents in 2020. Based on trends over the last 20 years, a long-term average increase in VMT of 1.6%/year was assumed, which yields a 2020 average trip length of 6.12 miles from a 2007 estimate of 4.98 miles/trip. The estimated ADT was multiplied by an estimated average distance per trip to estimate total annual vehicle miles traveled; which totals approximately 79 million vehicle miles per year for all future residents. The total miles traveled was multiplied by average fleet fuel economy (21 miles per gallon for 2007) and a coefficient representing the GHG content of gasoline in 2020 (17.608 lbs of CO<sub>2</sub> per gallon of gasoline, 10% lower than motor fuel in 2007) (US DOE). Reflecting the current policy situation, these calculations assume full implementation of the mandated California Low Carbon Fuel Standard with no change in average fuel economy. Transportation-related greenhouse gas emissions are reported in metric tons per year.

## CARBON STORAGE

### *Background*

Natural vegetation and soils temporarily store carbon as part of the terrestrial carbon cycle. Carbon is assimilated into plants and animals as they grow and then dispersed back into the environment when they die. There are two sources of carbon storage at Merriam Mountains project location: natural vegetation and soils.

### *Natural vegetation*

Living vegetation stores carbon; however, it is difficult to assess net changes in carbon storage associated with the Merriam Mountains development. The key issue is the balance between the loss of natural vegetation and future carbon storage associated with landscaping and residential development. For example, the community's landscaping palette will feature shrubs and trees which may provide equal or greater carbon storage on a per acre basis. The situation is further complicated by changes in fire regime. Carbon in natural vegetation is likely to be released into the atmosphere through wildfire every 20 to 150 years. Carbon in landscaped areas will be protected from wildfire. The balance between these factors will influence the long-term carbon budget on the site.

### *Soils*

The majority of carbon within the site is stored in the soil. Soil carbon accumulates from inputs of plant and animal matter, roots, and other living components of the soil ecosystem (e.g., bacteria, worms, etc.). Soil carbon is lost through biological respiration, erosion, and other forms of disturbance. Overall, soil carbon moves more slowly through the carbon cycle, and it offers greater potential for long-term carbon storage. Field observations suggest that urban soils can sequester relatively large amounts of carbon, particularly in residential areas where management increases inputs to the soil and reduces disturbance. Observations from across the United States suggest that cities in warmer and drier climates (such as San Diego) may have slightly higher soil organic matter levels when compared to equivalent areas before development (Pouyat et al. 2006).

### *Impact of project on carbon storage*

On balance, residential landscaping and soils may increase carbon storage compared to pre-development conditions; however, these gains may be offset by vegetation and soil storage lost to more extensive impervious surface areas. It is difficult to predict the net change, but it is expected to be relatively small (Muller 1992).

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# Merriam Mountain Development Greenhouse Gas Inventory



Summary		Category	Source	2007 T CO2e/year	2020 T CO2e/year	Absolute reduction	Reduction from base	Offset to zero
Scope 1			Natural gas	9,580	9,580			
Scope 2			Purchased electricity	24,924	21,497			
Scope 3 (transportation)			ADT method	29,865	33,269			
Scope 3 (water)			Embodied energy (average)	1,179	1,179			
TOTAL Scope 1 and 2				34,505	31,078			
TOTAL Scope 1, 2, and 3				64,369	64,347			
<b>TOTAL MMSP</b>				<b>35,684</b>	<b>32,257</b>	<b>6,451</b>	<b>20%</b>	<b>25,805</b>
Scope 1			15% better than Title 24		8,431			
Scope 2			-15% electricity + -12% gas		19,014			
<b>TOTAL MMSP</b>					<b>28,034</b>	<b>4,223</b>	<b>13.1%</b>	<b>28,034</b>
Scope 1			25% better than Title 24		6,515			
Scope 2			-25% electricity + -32% gas		18,409			
<b>TOTAL MMSP</b>					<b>25,513</b>	<b>6,744</b>	<b>20.9%</b>	<b>25,513</b>
Scope 1			35% better than Title 24		5,940			
Scope 2			-32% electricity + -38% gas		17,561			
<b>TOTAL MMSP</b>					<b>24,091</b>	<b>8,166</b>	<b>25.3%</b>	<b>24,091</b>
Scope 1			15% better than Title 24		8,431			
Scope 2			with 50% PV		17,760			
<b>TOTAL MMSP</b>					<b>26,780</b>	<b>5,477</b>	<b>17.0%</b>	<b>26,780</b>
Scope 1			25% better than Title 24		6,515			
Scope 2			with 50% PV		17,154			
<b>TOTAL MMSP</b>					<b>24,259</b>	<b>7,998</b>	<b>24.8%</b>	<b>24,259</b>
Scope 1			35% better than Title 24		5,940			
Scope 2			with 50% PV		16,307			
<b>TOTAL MMSP</b>					<b>22,837</b>	<b>9,420</b>	<b>29.2%</b>	<b>22,837</b>

&lt; 15% better than T24

&lt; 25% better than T24

&lt; 35% better than T24

&lt; 15% better than T24 plus 50% PV penetration

&lt; 25% better than T24 plus 50% PV penetration

&lt; 35% better than T24 plus 50% PV penetration



Transportation (Scope 3)									
Transportation (trips by population)	Residents per land use	Trips per person	Trips per type	miles/trip	miles per type/d	miles/type/yr	CO2 lbs/mi	CO2e lbs/yr	CO2e T/yr
Commercial	0	2.66	0	4.98	0	0.00E+00	0.83672	0.00E+00	0.00E+00
Single family	2908	2.66	7734	4.98	38515	1.41E+07	0.83672	1.18E+07	5.88E+03
Var. density	3168	2.66	8426	4.98	41959	1.53E+07	0.83672	1.28E+07	6.41E+03
Multi-family	675	2.66	1796	4.98	8942	3.26E+06	0.83672	2.73E+06	1.37E+03
Estate	25	2.66	67	4.98	331	1.21E+05	0.83672	1.01E+05	5.06E+01
									1.37E+04
Transportation (per capita VMT method)	Per capita VMT	Residential pop	Residential VMT/year	Avg. fuel economy	Gasoline use (gallons/year)	Lbs CO2 per gallon	Lbs CO2/yr	Tons CO2/year	< no project < 2007 fuel < 2020 fuel
2007	9899	0	0	21	0	19.424	0		
2020	12168	5728	69692220	21	3318677	19.424	64462838.2	3.22E+04	
2020	12168	5728	69692823	21	3318706	17.608	58434445.49	2.92E+04	
2007 FUEL transportation (trips by neighborhood)	ADT	miles/trip	miles per type/d	miles/type/yr	Avg fuel economy	Gallons/year	Lbs CO2 per gallon	CO2 lbs/yr	CO2e T/yr
Neighborhood 1	19684	4.98	98026	35779607	21	1703791	19.424	33094432	16547
Neighborhood 2	4192	4.98	20876	7619798	21	362848	19.424	7047951	3524
Neighborhood 3	2520	4.98	12550	4580604	21	218124	19.424	4236841	2118
Neighborhood 4	3710	4.98	18476	6743667	21	321127	19.424	6237571	3119
Neighborhood 5	5300	4.98	26394	9633810	21	458753	19.424	8910815	4455
Neighborhood 6	120	4.98	598	218124	21	10387	19.424	201754	101
									2.99E+04
2020 FUEL transportation (trips by neighborhood)	ADT	miles/trip	miles per type/d	miles/type/yr	Avg fuel economy	Gallons/year	Lbs CO2 per gallon	CO2 lbs/yr	CO2e T/yr
Neighborhood 1	19684	6.12	120466	43970119	21	2093815	17.608	36867061	18434
Neighborhood 2	4192	6.12	25655	9364090	21	445909	17.608	7851388	3926
Neighborhood 3	2520	6.12	15422	5629176	21	268056	17.608	4719823	2360
Neighborhood 4	3710	6.12	22705	8287398	21	394638	17.608	6948628	3474
Neighborhood 5	5300	6.12	32436	11839140	21	563769	17.608	9926611	4963
Neighborhood 6	120	6.12	734	268056	21	12765	17.608	224753	112
									3.33E+04

Water use (Scope 3)								
Neighborhood	Population	Gallons/person/day	total gallons/year	Water use (AF/year)	GHG (lb/CO2)/AF of potable water	GHG (lb/CO2)/AF of reclaimed water	Embodied CO2/lbs/year	Embodied Metric T CO2/year
Estimated per capita	6750	200	492,750,000.00	1512	1759	529	2659949.64	1207

Neighborhood	Gallons/day	total gallons/year	Water use (AF/year)	GHG (lb/CO2)/AF of potable water	GHG (lb/CO2)/AF of reclaimed water	Embodied CO2/lbs/year	Embodied Metric T CO2/year	< Value used in inventory
Residential	876000	319,740,000.00	981	1759	529	1726011.766	783	
Commercial	17170	6,267,050.00	19	1759	529	33830.61875	15	
Parks	43860	16,008,900.00	49	1759	529	86418.80829	39	
Open Space	381900	139,393,500.00	428	1759	529	752470.198	341	
Average	1318930	481,409,450.00	1477	1759	529	2598731.391	1179	
Max	2,770,000.00	1,011,050,000.00	3103	1759	529	5457822.594	2476	

Commercial land use (Scope 2)											
Commercial type	Type	Number of units	Total sq-ft	Base electricity use (kWhr/ft2/yr)	T24 -10% (kWhr/ft2/yr)	T24 -15% (kWhr/ft2/yr)	T24 -20% (kWhr/ft2/yr)	T24 -25% (kWhr/ft2/yr)	T24 -35% (kWhr/ft2/yr)	Base total electricity use (kWhr/yr)	Base total electric (Mhr/yr)
Generic commercial use	Retail - excluding mall	n/a	110000	14		11.2		10.5	9.52	1.54E+06	1.54E+03

Residential land use (Scope 1 and 2)											
Planning Area	Residential type	Lot size/product type	Prototype	Number of units	Avg. sq-ft	Bedrooms	Base Title24 kWh/sq	Title 24 -15% kWh/sq	Title 24 -25% kWhr/sq	Title 24 -35% kWhr/sq	Base Total kWh/year per unit
2.0	Multi-family	Apartments	n/a	270	1000	2	2.216	1.773	1.662	1.507	2216
3.0	Variable Residential	Townhome	Bridgeport	84	1426	3	2.861	2.288	2.145	1.945	4079
4.0	Variable Residential	Townhome	Ravenna	153	1452	3	2.861	2.288	2.145	1.945	4153
5.0	Variable Residential	Townhome	San Moritz	140	1390	2	2.861	2.288	2.145	1.945	3976
6.0	Variable Residential	Townhome	Gianni	193	1395	2	2.861	2.288	2.145	1.945	3990
7.0	Variable Residential	Townhome	Bridgeport	173	1426	3	2.861	2.288	2.145	1.945	4079
1.1	Variable Residential	50x80	Garden Walk	56	2139	4	2.861	2.288	2.145	1.945	6119
1.2	Variable Residential	SFD Condo	Amante	57	1804	3	2.861	2.288	2.145	1.945	5160
1.3	Variable Residential	Townhome	Ravenna	76	1452	3	2.861	2.288	2.145	1.945	4153
2.1	Variable Residential	SFD Condo	Amante	71	1804	3	2.861	2.288	2.145	1.945	5160
2.2	Variable Residential	50x80	Garden Walk	52	2139	4	2.861	2.288	2.145	1.945	6119
2.3	Variable Residential	SFD Condo	Ivy Wreath	135	1700	3	2.861	2.288	2.145	1.945	4863
3.0	Variable Residential	Townhome	Ravenna	77	1452	3	2.861	2.288	2.145	1.945	4153
1.0	SFD	50x80	Rosemary Lane	94	2814	4	5.240	4.192	3.930	3.563	14745
2.0	SFD	55x100	Travatta	124	3655	5	5.240	4.192	3.930	3.563	19152
3.0	SFD	55x100	Travatta	34	3655	5	5.240	4.192	3.930	3.563	19152
1.0	SFD	45x100	Rosemary Lane	129	2814	4	5.240	4.192	3.930	3.563	14745
2.0	SFD	50x100	Silvercrest	103	3133	5	5.240	4.192	3.930	3.563	16417
3.0	SFD	60x100	Reunion	139	3594	5	5.240	4.192	3.930	3.563	18833
1.0	SFD	50x80	Rosemary Lane	79	2461	4	5.240	4.192	3.930	3.563	12896
2.0	SFD	55x100	Travatta	90	3655	5	5.240	4.192	3.930	3.563	19152
3.0	SFD	50x80	Rosemary Lane	103	2814	4	5.240	4.192	3.930	3.563	14745
4.0	SFD	55x100	Travatta	78	3655	5	5.240	4.192	3.930	3.563	19152
5.0	SFD	65x110	Reunion	180	3594	5	5.240	4.192	3.930	3.563	18833
Estate	SFD	2 acre min	Custom	10	4000	6	5.240	4.192	3.930	3.563	20960
TOTAL				2700							

T24 -15% (Mhr/yr)	T24 -25% (Mhr/yr)	T24 -35% (Mhr/yr)	2007 Metric T CO2e/year	2020 Metric T CO2e/year	T24 -15% 2020 Grid CO2e (metric T/year)	T24 -25% 2020 Grid CO2e (metric T/year)	T24 -35% 2020 Grid CO2e (metric T/year)
1.23E+03	1.16E+03	1.05E+03	7.13E+02	6.75E+02	4.90E+02	4.60E+02	4.17E+02

Title 24 -15% kWh/year per unit	Title 24 -25% kWh/year per unit	Title 24 -35% kWh/year per unit	Frig (kWh/yr)	Clothes washer (kWh/yr)	Dishwasher (kWh/yr)	Plugs	Base Total kWhr/yr per unit	Base Total for all units (kWhr/yr)	Base Total for all units (MW/yr)	T24 -15% Total for all units (MW/yr)	T24 -25% Total for all units (MW/yr)	T24 -35% Total for all units (MW/yr)	Base Total - 50% PV (MWhr/yr for all DU)
1773	1662	1507	669	1838	171.6	1670	6564	1.77E+06	1.77E+03	1.65E+03	1.62E+03	1.58E+03	1.77E+03
3263	3059	2774	669	2756	205.9	2381	10092	8.48E+05	8.48E+02	7.79E+02	7.62E+02	7.38E+02	7.85E+02
3323	3115	2824	669	2756	205.9	2425	10209	1.56E+06	1.56E+03	1.43E+03	1.40E+03	1.36E+03	1.45E+03
3181	2982	2704	669	1838	171.6	2321	8975	1.26E+06	1.26E+03	1.15E+03	1.12E+03	1.08E+03	1.15E+03
3192	2993	2713	669	1838	171.6	2330	8998	1.74E+06	1.74E+03	1.58E+03	1.54E+03	1.49E+03	1.59E+03
3263	3059	2774	669	2756	205.9	2381	10092	1.75E+06	1.75E+03	1.60E+03	1.57E+03	1.52E+03	1.62E+03
4895	4589	4161	669	3675	240.2	3572	14275	7.99E+05	7.99E+02	7.31E+02	7.14E+02	6.90E+02	7.58E+02
4128	3870	3509	669	2756	205.9	3013	11804	6.73E+05	6.73E+02	6.14E+02	5.99E+02	5.79E+02	5.88E+02
3323	3115	2824	669	2756	205.9	2425	10209	7.76E+05	7.76E+02	7.13E+02	6.97E+02	6.75E+02	7.20E+02
4128	3870	3509	669	2756	205.9	3013	11804	8.38E+05	8.38E+02	7.65E+02	7.47E+02	7.21E+02	7.33E+02
4895	4589	4161	669	3675	240.2	3572	14275	7.42E+05	7.42E+02	6.79E+02	6.63E+02	6.40E+02	7.04E+02
3890	3647	3307	669	2756	205.9	2839	11333	1.53E+06	1.53E+03	1.40E+03	1.37E+03	1.32E+03	1.33E+03
3323	3115	2824	669	2756	205.9	2425	10209	7.86E+05	7.86E+02	7.22E+02	7.06E+02	6.84E+02	7.29E+02
11796	11059	10027	669	3675	240.2	4699	24029	2.26E+06	2.26E+03	1.98E+03	1.91E+03	1.82E+03	2.12E+03
15322	14364	13023	669	4594	274.5	6104	30793	3.82E+06	3.82E+03	3.34E+03	3.22E+03	3.06E+03	3.63E+03
15322	14364	13023	669	4594	274.5	6104	30793	1.05E+06	1.05E+03	9.17E+02	8.84E+02	8.39E+02	9.97E+02
11796	11059	10027	669	3675	240.2	4699	24029	3.10E+06	3.10E+03	2.72E+03	2.62E+03	2.49E+03	2.91E+03
13134	12313	11164	669	4594	274.5	5232	27186	2.80E+06	2.80E+03	2.46E+03	2.38E+03	2.26E+03	2.65E+03
15066	14124	12806	669	4594	274.5	6002	30372	4.22E+06	4.22E+03	3.70E+03	3.57E+03	3.38E+03	4.02E+03
10317	9672	8769	669	3675	240.2	4110	21590	1.71E+06	1.71E+03	1.50E+03	1.45E+03	1.38E+03	1.59E+03
15322	14364	13023	669	4594	274.5	6104	30793	2.77E+06	2.77E+03	2.43E+03	2.34E+03	2.22E+03	2.64E+03
11796	11059	10027	669	3675	240.2	4699	24029	2.47E+06	2.47E+03	2.17E+03	2.10E+03	1.99E+03	2.32E+03
15322	14364	13023	669	4594	274.5	6104	30793	2.40E+06	2.40E+03	2.10E+03	2.03E+03	1.92E+03	2.29E+03
15066	14124	12806	669	4594	274.5	6002	30372	5.47E+06	5.47E+03	4.79E+03	4.62E+03	4.38E+03	5.20E+03
16768	15720	14253	669	5513	308.8	6680	34130	3.41E+05	3.41E+02	2.99E+02	2.89E+02	2.74E+02	3.26E+02

T24-15% + 50% PV (MWhr/yr for all DU)	T24-25% + 50% PV (MWhr/yr for all DU)	T24-35% + 50% PV (MWhr/yr for all DU)	%reduction with T-15 + 50% solar	Base 2007 Grid CO2e (metric T/year)	Base 2020 Grid CO2e (metric T/year)	T24 -15% 2020 Grid CO2e (metric T/year)	T24 -25% 2020 Grid CO2e (metric T/year)	T24 -35% 2020 Grid CO2e (metric T/year)	T24-15% + 50% PV (CO2e metric T/year)	T24-25% + 50% PV (CO2e metric T/year)	T24-35% + 50% PV (CO2e metric T/year)	Gas, Therms/sqft	Gas use (therms/unit/yr)	Gas use (therms/all units)	CO2 lbs/therm	CO2 from gas (lbs)
1.65E+03	1.62E+03	1.58E+03	6.8%	9.04E+02	7.77E+02	7.25E+02	7.12E+02	6.93E+02	7.25E+02	7.12E+02	6.93E+02	0.268	268	72360	13.0260	9.43E+05
7.17E+02	7.00E+02	6.76E+02	15.4%	4.32E+02	3.72E+02	3.42E+02	3.34E+02	3.24E+02	3.14E+02	3.07E+02	2.96E+02	0.268	382	32102	13.0260	4.18E+05
1.32E+03	1.29E+03	1.25E+03	15.4%	7.97E+02	6.85E+02	6.29E+02	6.15E+02	5.96E+02	5.80E+02	5.66E+02	5.46E+02	0.268	389	59538	13.0260	7.76E+05
1.04E+03	1.01E+03	9.75E+02	17.1%	6.41E+02	5.51E+02	5.02E+02	4.90E+02	4.73E+02	4.57E+02	4.45E+02	4.27E+02	0.268	373	52153	13.0260	6.79E+05
1.44E+03	1.40E+03	1.35E+03	17.1%	8.86E+02	7.62E+02	6.94E+02	6.77E+02	6.54E+02	6.31E+02	6.14E+02	5.91E+02	0.268	374	72155	13.0260	9.40E+05
1.48E+03	1.44E+03	1.39E+03	15.4%	8.90E+02	7.66E+02	7.04E+02	6.88E+02	6.67E+02	6.48E+02	6.32E+02	6.10E+02	0.268	382	66115	13.0260	8.61E+05
6.89E+02	6.72E+02	6.48E+02	13.8%	4.08E+02	3.51E+02	3.21E+02	3.13E+02	3.03E+02	3.02E+02	2.95E+02	2.84E+02	0.268	573	32102	13.0260	4.18E+05
5.29E+02	5.15E+02	4.94E+02	21.3%	3.43E+02	2.95E+02	2.69E+02	2.63E+02	2.54E+02	2.32E+02	2.26E+02	2.17E+02	0.268	483	27558	13.0260	3.59E+05
6.56E+02	6.41E+02	6.19E+02	15.4%	3.96E+02	3.40E+02	3.13E+02	3.06E+02	2.96E+02	2.88E+02	2.81E+02	2.71E+02	0.268	389	29574	13.0260	3.85E+05
6.59E+02	6.41E+02	6.16E+02	21.3%	4.27E+02	3.68E+02	3.35E+02	3.27E+02	3.16E+02	2.89E+02	2.81E+02	2.70E+02	0.268	483	34327	13.0260	4.47E+05
6.40E+02	6.24E+02	6.02E+02	13.8%	3.79E+02	3.26E+02	2.98E+02	2.91E+02	2.81E+02	2.81E+02	2.74E+02	2.64E+02	0.268	573	29809	13.0260	3.88E+05
1.20E+03	1.17E+03	1.12E+03	21.7%	7.80E+02	6.71E+02	6.13E+02	5.99E+02	5.79E+02	5.26E+02	5.11E+02	4.91E+02	0.268	456	61506	13.0260	8.01E+05
6.65E+02	6.49E+02	6.27E+02	15.4%	4.01E+02	3.45E+02	3.17E+02	3.10E+02	3.00E+02	2.92E+02	2.85E+02	2.75E+02	0.268	389	29963	13.0260	3.90E+05
1.84E+03	1.77E+03	1.68E+03	18.4%	1.15E+03	9.91E+02	8.69E+02	8.39E+02	7.96E+02	8.08E+02	7.78E+02	7.35E+02	0.268	754	70890	13.0260	9.23E+05
3.16E+03	3.04E+03	2.87E+03	17.3%	1.95E+03	1.67E+03	1.47E+03	1.41E+03	1.34E+03	1.39E+03	1.33E+03	1.26E+03	0.268	980	121463	13.0260	1.58E+06
8.66E+02	8.34E+02	7.88E+02	17.3%	5.34E+02	4.59E+02	4.02E+02	3.88E+02	3.68E+02	3.80E+02	3.66E+02	3.46E+02	0.268	980	33304	13.0260	4.34E+05
2.53E+03	2.43E+03	2.30E+03	18.4%	1.58E+03	1.36E+03	1.19E+03	1.15E+03	1.09E+03	1.11E+03	1.07E+03	1.01E+03	0.268	754	97286	13.0260	1.27E+06
2.31E+03	2.22E+03	2.11E+03	17.5%	1.43E+03	1.23E+03	1.08E+03	1.04E+03	9.91E+02	1.01E+03	9.76E+02	9.24E+02	0.268	840	86483	13.0260	1.13E+06
3.49E+03	3.36E+03	3.18E+03	17.3%	2.15E+03	1.85E+03	1.62E+03	1.56E+03	1.48E+03	1.53E+03	1.47E+03	1.39E+03	0.268	963	133884	13.0260	1.74E+06
1.38E+03	1.33E+03	1.26E+03	18.8%	8.70E+02	7.48E+02	6.59E+02	6.36E+02	6.05E+02	6.07E+02	5.85E+02	5.54E+02	0.268	660	52104	13.0260	6.79E+05
2.29E+03	2.21E+03	2.09E+03	17.3%	1.41E+03	1.22E+03	1.06E+03	1.03E+03	9.74E+02	1.01E+03	9.68E+02	9.15E+02	0.268	980	88159	13.0260	1.15E+06
2.02E+03	1.94E+03	1.84E+03	18.4%	1.26E+03	1.09E+03	9.52E+02	9.19E+02	8.72E+02	8.85E+02	8.52E+02	8.05E+02	0.268	754	77678	13.0260	1.01E+06
1.99E+03	1.91E+03	1.81E+03	17.3%	1.22E+03	1.05E+03	9.22E+02	8.90E+02	8.44E+02	8.72E+02	8.39E+02	7.93E+02	0.268	980	76404	13.0260	9.95E+05
4.52E+03	4.35E+03	4.12E+03	17.3%	2.79E+03	2.40E+03	2.10E+03	2.03E+03	1.92E+03	1.98E+03	1.91E+03	1.80E+03	0.268	963	173375	13.0260	2.26E+06
2.85E+02	2.74E+02	2.59E+02	16.6%	1.74E+02	1.50E+02	1.31E+02	1.27E+02	1.20E+02	1.25E+02	1.20E+02	1.14E+02	0.268	1072	10720	13.0260	1.40E+05
				2.42E+04	2.08E+04	1.85E+04	1.79E+04	1.71E+04	1.73E+04	1.67E+04	1.59E+04					

BASE CO2e from gas (T/yr)	-15% CO2e from gas (T/yr)	-25% CO2e from gas (T/yr)	-35% CO2e from gas (T/yr)
428	376	291	265
190	167	129	118
352	310	239	218
308	271	210	191
426	375	290	264
391	344	266	242
190	167	129	118
163	143	111	101
175	154	119	108
203	179	138	126
176	155	120	109
364	320	247	225
177	156	120	110
419	369	285	260
718	632	488	445
197	173	134	122
575	506	391	356
511	450	348	317
791	696	538	491
308	271	209	191
521	459	354	323
459	404	312	285
452	397	307	280
1025	902	697	635
63	56	43	39
9.58E+03	8.43E+03	6.51E+03	5.94E+03



Dr. Malcolm Lewis, PE  
President  
JN: 60823

May 31, 2007

June Collins  
Vice President, Environmental Division Manager  
DUDEK Third Street  
Encinitas, CA 92024

Re: Questions regarding Merriam Mountain GHG inventory

Dear June:

I've addressed the two follow up questions regarding Merriam Mountain GHG's in the attached memo. Let me know if this meets your needs and feel free to contact me by phone at (202) 731-0801 or via e-mail at [cpyke@ctgenergetics.com](mailto:cpyke@ctgenergetics.com).

Best Regards,

Chris Pyke

## Questions

- Section 3.8.2.: Emissions on opening day until 2020
- Section 3.8.3.: Comparative analysis of project under “business-as-usual” and with proposed Project Design Features.

## Responses

The following table and figure address both questions. There are essentially three important scenarios:

- (1) “Business-as-usual” (BAU): The project built to Title 24 requirements without additional energy saving and greenhouse gas reducing features.
- (2) BAU – Renewable Portfolio Standard: The project built to Title 24 requirements minus reduction associated with incremental implementation of the state-wide Renewable Portfolio Standard.
- (3) As proposed: The project built to the proposed specifications.

The proposed Project Design Features result in approximately 28% greenhouse gas reduction from BAU to the proposed project by build-out in 2017. This increases to over 30% by 2020 with the completion of the phase-in of the state-wide Renewable Portfolio Standard. Table 1 provides greenhouse gas emissions estimates for the estimated end of each phase of construction. Note that the actual date of completion may vary depending on market conditions.

**Table 1.** Greenhouse gas emissions at the end of each construction phase (metric tons CO<sub>2</sub>e per year).

	Phase I	Phase II	Phase III	Phase IV	
	2010	2012	2014	2017	2020
<b>BAU</b>	13,560	23,551	28,547	35,684	35,684
<b>BAU-RPS</b>	13,259	22,681	27,071	33,048	32,257
<b>As proposed</b>	10,458	17,817	21,174	25,677	24,886

**Figure 1.** Illustration of greenhouse gas emissions under three scenarios from 2010 (estimated completion of Phase I) through 2017 (estimated build-out) to 2020 (full implementation of the RPS).

